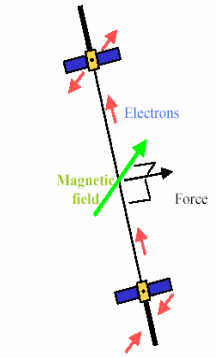
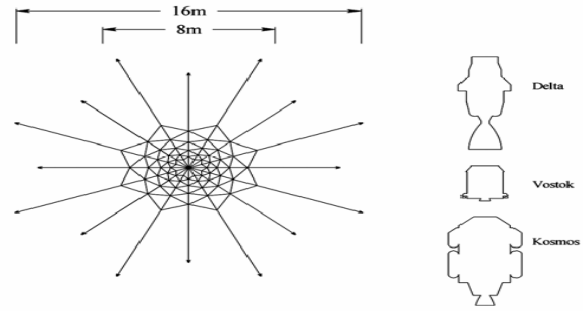
JOSEPH CARROLL
Tether Applications, Inc.

Space Transport Developing using Orbital Debris

Orbital debris is a minor annoyance for many space programs, and a major issue for others like the ISS. We propose to investigate a development scenario and architecture that convert orbital debris into both an opportunity and also a resource. The basic concept is to use a small fleet of agile electro-dynamic maneuvering vehicles to rendezvous with and capture debris objects. The vehicles can de-boost smaller objects into short-lived orbits or controlled re-entry trajectories. They would boost more massive objects into low-risk storage orbits intended to allow easy recovery later. In this scenario, debris provides an opportunity to demonstrate and operationally use tethered capture capabilities, without risking more expensive space assets. This process allows extensive use and refinement of targeting sensors and rendezvous and capture strategies that are relevant to more ambitious tether transport facilities such as HASTOL and MXER. It also provides a key resource for such facilities, in that an ability to adjust the orbits of most of the >1,000 tons of orbital debris now in low Earth orbit allows this debris mass to be accumulated and used as the main ballast mass for a few ambitious tether transport facilities. Large orbital debris objects tend to cluster in a few particularly useful inclinations like Sun-synchronous orbit, so debris-ballasted tether facilities can serve transport needs to useful inclinations. Our Phase I effort will focus on characterizing the debris population, exploring capture concepts suite to that population, quantifying guidance issues, and estimating the throughput of a straw man system.





~100-gram thrown-web, to scale with spent stages

Net spin-up viewed from support, with desired payload trajectory shown in frame 3.